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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,037	07/30/2003	Ramachandra N. Pai	BEA920030015US1	7080

49056 7590 09/10/2008
LIEBERMAN & BRANDSDORFER, LLC
802 STILL CREEK LANE
GAITHERSBURG, MD 20878

EXAMINER	
CHANKONG, DOHM	
ART UNIT	PAPER NUMBER
2152	
MAIL DATE	DELIVERY MODE
09/10/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/630,037	PAI, RAMACHANDRA N.	
	Examiner	Art Unit	
	DOHM CHANKONG	2152	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5,7-10,12,14-16 and 18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 2, 5, 7-10, 12, 14-16, and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to Applicant's request for continued examination, filed on 6.24.2008. Claims 1, 7, 12, 14, and 16 are amended. Claim 18 is added. Claims 3, 4, 6, 11, and 17 are canceled. Thus, claims 1, 2, 5, 7-10, 12, 14-16, and 18 are presented for further examination.

2. This action is a non-final rejection.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/24/08 has been entered.

Response to Arguments

I. APPLICANT'S ARGUMENTS

The rejections of claims 7-10 for being directed towards non-statutory subject matter are maintained. Additionally, Applicant arguments countering the examiner's interpretation of the term "maximum connectivity count" are not persuasive.

A. §101 rejection of claims 7-10

As to claims 7-10, Applicant argues that because they drawn to a system, they are apparatus claims. Therefore, according to Applicant's analysis, the counter is necessarily a hardware element. However, it is the PTO's current position that use of the word "system" does not inherently mean that the claim is directed to a machine or apparatus. Only if at least one of the claimed elements of the system is a physical part of a device can the system as claimed constitute part of a device to be a machine within the meaning of §101. Thus, Applicant's specification must be reviewed to determine the broadest reasonable interpretation of the claimed element.

Here, the elements in amended system claim 7 are a graph and a counter. Either of these claimed elements must be interpreted as a physical part of the system in order to constitute a machine under §101. However, if both of the claimed elements are interpreted as a software element, then the system is merely directed to software alone. The claimed graph comprises at least two vertices wherein the vertices are a computing node, components on a circuit board, division of points in a pattern, and partitions of items. If a vertex is interpreted as merely a point in a pattern, the graph is not a "physical" item but may be merely a point of a pattern on a piece of paper. A graph of points would clearly not be a physical part of the system. Therefore, because one possible embodiment of the claimed graph includes non-hardware, the claimed graph is not a physical part of the claimed system. This rejection would be overcome if the graph can only be interpreted as a grouping of computing nodes or components on a circuit board since these vertices would be clearly physical elements.

As to the counter, Applicant's specification is silent as to whether the "counter" is a physical or software element. However, one of ordinary skill in the art could reasonably interpret the term counter may be implemented as software. In other words, one of ordinary skill in the art would be able to implement the claimed counter within a system as either a software or hardware component. There is no discussion in Applicant's specification of any hardware or physical elements that would have led one of ordinary skill in the to believe that the system is to be implemented as a machine. Therefore, claims 7-11 are rejected for being directed towards non-statutory subject matter.

B. The interpretation of "maximum connectivity count"

Applicant argues that the term "maximum connectivity count" is defined in paragraph 0014. Since Applicant's publication does not contain numbered paragraphs, the examiner assumes the citation refers to paragraph 0014 of Applicant's published patent application, 20050027780. At the cited paragraph, the term is not expressly mentioned. The paragraph does define "maximum connectivity" as a condition when two-way communication exists between each node in the cluster however, this oblique reference does not provide guidance on how to interpret "maximum connectivity count." The term will be interpreted as simply referring to the quantity of vertices remaining in the graph for the reasoning set forth in the previous action.

II. APPLICANT'S AMENDMENTS DO NO OVERCOME THE CITED PRIOR ART REFERENCES.

Applicant argues that Östergård does not teach the limitations as now amended. Specifically, Applicant argues that Östergård applies a pruning method different from that of Applicant's method. In Applicant's view, Östergård's pruning method "is based upon the premise of the number of vertices in the graph" [Applicant's arguments, pg. 10:¶1] while

Applicant's method "removes a vertex with the lowest connectivity count" [Applicant's arguments, pg. 9:¶3]. Applicant further argues that Östergård "limits the search for a clique to a subset of vertices neighboring to one selected vertex while Applicant's method "can search for any clique." Applicant's arguments are not persuasive because Östergård teaches the limitations as claimed and because some of the differences argued by Applicant are not reflected in the claim language.

For example, Applicant's argument of "selecting a vertex with a least sum of said connectivity counts of all neighboring vertices (if multiple vertices have the same connectivity count)." This limitation is not recited in the claim but if included may help overcome Östergård. Applicant's argument that the claimed algorithm "can search for any clique" is immaterial as long as Östergård teaches the limitations. The differences must be reflected in the claim language.

Applicant argues that Östergård does not remove a vertex with the lowest connectivity count. However, Östergård discloses selecting a vertex with a least sum of said connectivity counts and then pruning this selected vertex from the graph [pgs. 200-202, see new algorithm : pruning those vertices whose connections are less then the max variable | pg. 202 : "Ordering the Vertices" – sorting the vertices with respect to their degrees (incident edges) so that the v1 has smallest degree]. Additionally, Östergård discloses it was well known in the art to base the algorithm on the number of remaining vertices in the entire graph [pg. 199, 2.1 – Old Algorithms : "the number of vertices in the graph is n"]. As to the other amendments, they are fully addressed in the rejection that follows. For the foregoing reasons, the examiner interprets Östergård's pruning algorithm as reading on Applicant's claimed algorithm. Applicant's

amendment does not overcome Östergård and therefore the rejections set forth in the previous action are maintained.

III. POSSIBLE INTERVIEW

In light of the technical subject matter of Applicant's algorithm and the challenges involved in fully capturing the details of the algorithm in claim language, Applicant may find it beneficial to schedule an interview with the examiner to clarify aspects of the invention where examiner has differing interpretations from what may actually be intended.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1, 2, 5, and 18 are rejected under 35 U.S.C. §101 because the claimed invention is directed towards non-statutory subject matter. Based on new guidance from the Board of Patent Appeals and Interferences in the informative opinion, *In re Bilski* (and pending review by the Federal circuit), this action contains a new §101 rejection of claims 1, 2, 5, and 18 because the claims are directed towards mental steps. In *Bilski*, the Board found that the absence of any apparatus in the appellants' method claim was evidence that the claims did not transform physical subject matter as a machine inherently would. It is the current position of the PTO that a §101 method or process must (1) be tied to another statutory class (such as an apparatus) or (2) transform underlying subject matter (such as an article or materials) to a different state or thing.

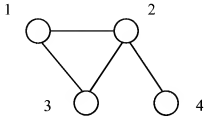
Here, claim 1 is recites a five-step method for maximizing group membership. The method operates on vertices of a graph where the vertices may be "a computing node,

components on a circuit board, division of points in a pattern, and partition of items." The §101 issue arises because each of the five steps may be carried out mentally. Whether the vertices are a computing node, components on a circuit board or points on a pattern, the algorithm does not actually transform any of those elements. The claim is merely directed to the algorithm for finding a maximal graph and does not physically transform any subject matter to a different state or thing. Additionally, the claims are not tied to another statutory class.

5. Claims 7-10 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims recite a "system" that comprises a "counter" and a graph. The use of the term "system" does not inherently mean that the claim is directed towards a machine. Only if at least one the claimed elements of the system is a physical part of a device can the system constitute a machine within the meaning of §101. There is no discussion in Applicant's specification of any hardware or physical elements that would have led one of ordinary skill in the to believe that the system is to be implemented as a machine. See also response to arguments above.

6. Claims 1, 2, 5, 7-10, 12, 14-16, and 18 are also rejected under 35 U.S.C. 101 because the disclosed invention is inoperative and therefore lacks utility. What follows is the examiner's understanding of Applicant's claims. Applicant defines a connectivity count as "a number of neighbors connected to the vertex." Thus, by definition, because the connectivity count only includes the neighbors of a vertex (and not the vertex itself), the connectivity count will always be less than the total number of vertices in the graph. An example is illustrative. For a graph

containing four vertices and where three vertices are connected to two vertices forming a triangle and the fourth simply connected to one of the vertices as seen below.



According to the definition in Applicant's claim, the connectivity count for each vertex would be: two for vertices 1 and 3, three for vertex 2, and one for vertex 4. The method describes a process for forming a clique when the connectivity count of a least connected vertex becomes equal to the number of remaining vertices in the graph. Here, the number of vertices in the graph starts with four. Applicant's claimed algorithm would select vertex 4 for removal since it is the least connected vertex based on its connectivity count. Once vertex 4 is removed, the connectivity count for the remaining three vertices is two and the number of remaining vertices is three. At this point, each of the vertices "is connected to each other vertex in the grouping" but the connectivity count of a least connected vertex is not equal to the number of remaining vertices. Thus, Applicant's algorithm will continue to prune off the remaining vertices because the connectivity count will always be less than the number of remaining vertices. The claimed algorithm is therefore inoperative because the condition where the connectivity count becoming equal to the number of remaining vertices will never be realized.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claims 1 are rejected for lacking proper antecedent basis: "..the number of remaining vertices in the graph."

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 2, 7-9, 12, 14, and 15 are rejected under 35 U.S.C §103(a) as being unpatentable over Östergård, "A Fast Algorithm for the Maximum Clique Problem."

9. As to claim 1, Östergård discloses a method for maximizing group membership comprising:

updating a connectivity count of each vertex in a graph, wherein each vertex represents a single item in a multiple item set, and wherein the connectivity count of a vertex is a number of

neighbors connected to the vertex [updating - pg. 200, Algorithm 2 (line 17) | pg. 202, section 2.4 - Ordering the vertices : calculating the degree of the vertex where the degree represents the number of connections to other vertices];

placing vertices in decreasing order of connectivity based upon said calculated connectivity count of each vertex in said graph [pg. 202 : "Ordering the Vertices" – sorting the vertices with respect to their degrees (incident edges) so that the v1 has smallest degree];

selecting each vertex with a connectivity count less than a maximum connectivity count [pg. 200, Algorithm 2 : selecting a vertex less than the max variable];

comparing the connectivity count of each vertex in said graph with the maximum connectivity count in the graph [pg. 200, line 14 of Algorithm 2 | pg. 201 - "Example"];

removing a vertex from the graph [pgs. 200-202 : pruning those vertices whose connections are less then the max variable]; and

returning a grouping of interconnected vertices, wherein each vertex in said grouping is connected to each other vertex in said grouping, and a quantity of interconnection is equal to said maximum connectivity count [pg. 200 – "the size of a maximum clique is given by c(1)"].

Östergård does not expressly disclose the term "maximum connectivity count" but does disclose calculating the number of vertices in the graph. As discussed in the §112 rejection above, "maximum connectivity count" is interpreted as number of vertices in the graph. Thus, it would have been obvious for one of ordinary skill in the art to have reasonably inferred that Östergård's disclosure of number of vertices in the graph is equivalent to Applicant's claimed "maximum connectivity count."

10. As to claim 2, Östergård discloses updating said connectivity count for all remaining vertices in said graph following removal of a single vertex from said graph [].

11. As to claim 18, Östergård discloses wherein the step of removing each selected vertex from the graph is continuous until said connectivity count of a least connected vertex is equal to said maximum connectivity count [pg. 200, Algorithm 2 (lines 24-29) : for loop].

12. As to claims 7-9, as they do not teach or further define over previously claimed limitations, they are rejected for at least the same reasons set forth for claims 1-4.

13. As to claim 12, Östergård discloses an article comprising:

a computer-readable recordable data storage medium [pg. 206 : Östergård discusses utilizing a CPU; therefore it would have been obvious for one of ordinary skill in the art to have reasonably inferred a computer-readable medium];

means in the medium for placing vertices in decreasing order of connectivity based upon said calculated connectivity count of each vertex in said graph [pg. 202 : "Ordering the Vertices" – sorting the vertices with respect to their degrees (incident edges) so that the v1 has smallest degree];

means in the medium for selecting each vertex with a connectivity count less than a maximum connectivity count [pg. 200, Algorithm 2 : selecting a vertex less than the max variable];

means in the medium for removing each selected vertex from said graph [pgs. 200-202 : pruning those vertices whose connections are less then the max variable];

a clique of interconnected vertices formed in response to the connectivity count of a least connected vertex being equal to a number of remaining vertices in the graph, wherein each vertex in the clique is connected to each other vertex in the clique [pgs. 200-202 : pruning those vertices whose connections are less then the max variable | "the size of a maximum clique is given by c(1)"].

14. As to claim 14, Östergård discloses said means for removing a least connected vertex for removal from a clique in said graph includes comparing a connectivity count of said least connected vertex with said maximum connectivity count obtained from placing vertexes of a graph in descending order [pg. 202, section 2.4 - Ordering the vertices : placing the vertex with smaller degree first | pgs. 200-202 : pruning those vertices whose connections are less then the max variable].

15. As to claim 15, see rejection of claim 2.

16. Claims 5, 10, and 16 are rejected under 35 U.S.C §103(a) as being unpatentable over Östergård in view of Pardalos et al, "An Exact Parallel Algorithm for the Maximum Clique Problem" ["Pardalos"], in further view of Szymanski et al, "Spanning Tree Algorithm for Spare Network Capacity" [Szymanski].

17. As to claim 5, 10 and 16, Östergård does not expressly disclose said vertex being selected from a group consisting of: a computing node, components on a circuit board, division of points in a pattern, or partition of items.

18. In the same field of invention, Pardalos is directed towards the same problem as Östergård. Pardalos is concerned with finding maximum cliques on general graphs. Pardalos discloses that a solution to such a problem has wide ranging applications, including circuit design, geometry and fault diagnosis. As such, Pardalos teaches selecting a vertex from components on a circuit board (circuit design), points in a pattern (geometry) and partition of items (fault diagnosis of multiprocessor systems) [pg. 3]. It would have been obvious to one of ordinary skill in the art to incorporate Pardalos' teachings into Östergård; namely to modify Östergård's maximum clique algorithm for use with components on a circuit board and points in a pattern. Pardalos' teaches that finding maximum cliques, as in Östergård, are especially useful such applications [Pardalos, pgs. 2-3].

19. In the same field of invention, Szymanski discloses applying maximum clique techniques to problems concerning networks. Szymanski discloses that a vertex in a graph is a computer node [pg. 0448]. It would have been obvious to one of ordinary skill in the art to 1incorporate Szymanski's teachings into Östergård; namely to modify Östergård for use with computer nodes. One would have been motivated to provide such a modification to use Östergård's algorithm for network capacity problems as taught by Szymanski.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DOHM CHANKONG whose telephone number is (571)272-3942. The examiner can normally be reached on Monday-Friday [8:30 AM to 4:30 PM].

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bunjob Jaroenchonwanit can be reached on 571.272.3913. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dohm Chankong/
Examiner, Art Unit 2152